Claims:

1. A process for forming a metal oxide film comprising a vapor deposition step in which a vapor of a hydrolyzable metal compound and water vapor are brought into contact with a substrate to form a film of a metal oxide precursor on the surface of the substrate and a calcination step in which the substrate is then heated in an oxidizing atmosphere to convert the precursor into a metal oxide, characterized in that in the vapor deposition step, the hydrolyzable metal compound vapor and the water vapor are previously mixed and the mixed vapors are brought into contact with the substrate within 3 seconds after mixing.

2. The process according to claim 1 wherein the vapor deposition step is carried out by injection of jetted streams of the hydrolyzable metal compound vapor and water vapor toward the substrate which is continuously moving, and the mixing is performed by injecting the hydrolyzable metal compound vapor and the water vapor in such a manner that the resulting two jetted vapor streams meet each other before they reach the substrate.

3. The process according to claim 2 wherein the hydrolyzable metal compound vapor is injected in a reverse direction with respect to the direction of movement of the substrate through a multi-orifice nozzle, and the water vapor is injected through a slit nozzle.

4. The process according to claim 2 wherein the angles of the center lines of the streams of the hydrolyzable metal compound vapor and water vapor (θM and θH_2O, respectively) satisfy the following relationship:

$30° \leq \theta M \leq 80°$ and $\theta M \geq \theta H_2O$,

and the flow rate of the stream of the hydrolyzable metal compound vapor is greater than that of the water vapor.

5 The process according to any of claims 1 to 4 wherein the hydrolyzable

metal compound is a metal chloride.

6. The process according to claim 5 wherein the metal chloride at least predominantly comprises $TiCl_4$, the temperature of the substrate in the vapor deposition step is in the range of 150 - 250 °C, and the heating temperature in the calcination step is in the range of 300 - 600 °C.

7. The process according to claim 6 wherein the proportions of the $TiCl_4$ vapor and the water vapor fed to the vapor deposition step are such that they give a $H_2O/TiCl_4$ molar ratio in the range of 0.05 - 4.

8. The process according to claim 1 wherein the metal oxide film functions as a photocatalyst.

9. A vapor deposition apparatus for forming a film on the surface of a continuously moving substrate by a reaction between two vapors, characterized in that the apparatus comprises a multi-orifice nozzle and a slit nozzle disposed in such directions that the vapor streams injected through the respective nozzles meet each other.

10. The vapor deposition apparatus according to claim 9 wherein the multi-orifice nozzle is disposed such that a vapor is injected therethrough in a reverse direction with respect to the direction of movement of the substrate.

11. The vapor deposition apparatus according to claim 9 or 10 wherein the pitch between adjacent orifices of the multi-orifice nozzle is in the range of from 3 mm to 10 mm.

12. The vapor deposition apparatus according to claim 9 or 10 wherein the two vapors are a vapor of a hydrolyzable metal compound and water vapor, and the hydrolyzable metal compound vapor is injected through the multi-orifice nozzle and

the water vapor is injected through the slit nozzle.

13. The vapor deposition apparatus according to claim 12 wherein the angle θ_1 between the center axis of the multi-orifice nozzle and the surface of the substrate is in the range of from 30° to 80°, and the angle θ_2 between the center axis of the slit nozzle and the surface of the substrate is smaller than θ_1.

14. The vapor deposition apparatus according to claim 13 wherein angle θ_1 is in the range of from 45° to 75°, and angle θ_2 is in the range of from 10° to 40°.

15. The vapor deposition apparatus according to claim 12 wherein the hydrolyzable metal compound is a metal chloride.

16. The vapor deposition apparatus according to claim 15 wherein the metal chloride at least predominantly comprises $TiCl_4$.